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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,019	01/29/2004	Masaki Sugiyama	1448.1049	2669

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EXAMINER	
PENG, CHARLIE YU	
ART UNIT	**PAPER NUMBER**
2883	

DATE MAILED: 10/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/766,019	SUGIYAMA ET AL.	
	Examiner	Art Unit	
	Charlie Peng	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 August 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *23 and 24* is/are allowed.

6)☒ Claim(s) *1-12,14,15,18,19,21 and 22* is/are rejected.

7)☒ Claim(s) *13,16,17 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Primary Examiner

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6, 8, 9, 18, 19, 21, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,790,689 to Behfar. Behfar teaches an optical waveguide having a curved waveguide ridge segment **48**, two straight segments **44/46**, and an electrode **58** on a substrate **50**. The curved segment acts as an optical waveguide to guide light from one straight segment to the other (i.e. input to output). (See at least **Fig. 2** and its descriptions) A curved optical path is inherent to the curved waveguide segment. Behfar further teaches a preferred fabrication process (**Fig. 7a**) during which a silicon dioxide layer (buffer layer) **316** is formed on the top side of an active waveguide **310**, which in turn is on top of a lower cladding **308** (ridge). (See at least **column 6**, **paragraph 3**) Behfar still further teaches he width of the cavity produced by this process is less than 1.0 micron, and preferably about 0.2 micron for single lateral mode operation. Although Behfar does not specifically state an etching method by which the curved patterns are formed on the substrate, it was disclosed that prior art teaches a chemically assisted ion beam etching process used to form the lasers as ridges on a substrate. (Column 1, lines 14-28) It thus would have been obvious to one of ordinary skill in the art to combine Behfar's invention with this process

to form laser as curved ridges on a substrate. The motivation would be that ion beam etching is a highly precise method, for example, the depth of etching can be controlled down to a scale of nanometers or angstroms.

With specific reference to claim 3, to form Behfar's curved ridge structure by etching on a substrate, the substrate material beyond the circumference of the curved structure are inherently removed (by etching).

With specific reference to claim 5, Behfar teaches the optical waveguide having the curved waveguide, ridge, and the buffer layer on an InP substrate. Behfar does not teach the substrate being made from lithium niobate (LNB). InP is a commonly used substrate for epitaxial growth, and LNB is a commonly used photorefractive material. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use lithium niobate as a substrate materials for Behfar's monolithic structure, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. The motivation would be to take advantage of LNB's high photorefractive sensitivity and diffraction efficiency.

With specific reference to claim 10, Behfar shows that the curved ridge (comprising both a top electrode 58 and the curved waveguide 66) has a height slightly larger than the waveguide, therefore, a centerline of the curved ridge would be slightly higher than that of the waveguide by virtue of a thickness of the electrode 58.

With specific reference to claim 19, Behfar teaches, in one embodiment illustrated in **Fig. 9**, a parallelogram setup of the straight waveguide segments

connected to the curvature segments, therefore two sets of straight segments would be parallel to each other.

With specific reference to claims 21 and 22, refer to an embodiment illustrated in Fig. 4 by Behfar.

Claims 7, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Behfar. Behfar teaches the optical waveguide having the curved waveguide ridge and the buffer layer on a substrate except for the particular dimensions of the ridge. It would have been obvious to one having ordinary skill in the art at the time the invention was made to decide on the size based on the design of the rest of waveguide structure, since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955). The motivation would be to select an electrode size that is not too large to adversely impact operations of rest of the waveguide structure adversely through heat generation, etc.

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Behfar in view of U.S. PGPub 2003/0128729 to Matsumura. Behfar teaches the curved optical waveguide segment **48** being connected to a straight segment **44/46** except for a coupling segment that connect the two segments having a width difference. Matsumura teaches that two ridge waveguide regions having different width are connected with a tapered waveguide region **C3/205**. (See at least **Fig. 15** and **[0114]**) It would have been obvious to one having ordinary skill in the art at the time the invention was made to connect the wider curvature segment to the narrower straight segment

using a tapered segment. The motivation would be that a tapered waveguide segment minimizes optical losses in the junction. (Also see U.S. Patent 6,483,966 to Bona et al.)

Allowable Subject Matter

Claims 13, 17, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Behfar and Takizawa teaches the optical waveguide structure with straight optical path segments except for a second ridge structure, a second buffer layer that cover a side of the second ridge structure, and a width change along the straight optical path or a shift in axis of the second ridge structure. It is the examiner's opinion that the prior art of record, taken alone or in combination, fails to disclose or render obvious in combination with the rest of the limitations of the base claim.

Claim 16 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Behfar and Matsumura teach the optical waveguide structure except for the straight segment being shifted off axis from the curvature segment. It is the examiner's opinion that the prior art of record, taken alone or in combination, fails to disclose or render obvious in combination with the rest of the limitations of the base claim.

Claims 23 and 24 are allowed. Prior art such as Behfar and U.S. Patent 4,818,063 to Takizawa teach optical devices of similar structures, certain steps of the method of manufacturing claimed by the applicants are not present or presented in the

same order in the prior art. For example, Behfar lacks using titanium diffusion to form a waveguide; Takizawa would have formed the buffer layer prior to the ridge structure; and neither Behfar nor Takizawa's method would suggest reasons for a modification by adding a first step of forming a proton exchange pattern on a substrate by proton exchange including a curved pattern. It is the examiner's opinion that the prior art of record, taken alone or in combination, fails to disclose or render obvious in combination with the rest of the limitations of the base claim.

Response to Arguments

The applicant's argument with respect to the Behfar reference and claims 1-4, 6, 8, 9, 18, 19, and 21, have been considered but is moot in view of new ground of rejection necessitated by amendment(s) made to independent claim 1. Furthermore, adding a method limitation, e.g., *by etching*, to an apparatus claim is generally not given patentable weight unless the applicant can show that the method provides a materially different property from the prior art and/or is an non-obvious improvement upon the prior art. Various types of etching including drying etching, wet (chemical) etching, reactive ion etching, and laser cutting are all commonly known in the art, and etching is recognized by anyone having ordinary skill in the art as the only viable method to create patterns on hard yet brittle optical substrates such as silicon.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charlie Peng whose telephone number is (571) 272-2177. The examiner can normally be reached on 9 am - 6 pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Charlie Peng
October 26, 2005

Brian Healy
Primary Examiner